

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

8

24. (Amended) A method according to Claim 22, further comprising:

configuring said structure to include a plurality of portions which each induce turbulence, said passageway having first and second sections which are separate and which each include at least two of said portions; and

selecting locations of said portions along said passageway such that each said portion is longitudinally spaced by a respective longitudinal distance from every other said portion which is adjacent thereto, wherein said longitudinal distances between said portions in said first section of said passageway are greater than said longitudinal distances between said portions in said second section of said passageway.

REMARKS

The specification has been amended, and Claims 1, 3-6, 8, 10-11, 15-18, 20 and 22-24 have been amended. Claims 2, 7, 9, 12-14 and 21 remain in the application unchanged. Claims 1-18 and 20-24 are thus present in the application. Reconsideration of the application, as amended, is respectfully requested.

Telephone Conference With Examiner

Applicants wish to make of record a telephone conference which took place between Examiner Ceric and the undersigned attorney on August 30, 2002. Examiner Ceric agreed to withdraw the objection to the presence of a comma in the preambles of Claims 17-18 and 20-21. In addition, Examiner Ceric and the undersigned discussed the rejection of Claims 1, 2, 4-10, 13-18 and 20-24 for indefiniteness under

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

9

the second paragraph of 35 U.S.C. §112. The undersigned maintained that these claims were already definite. Examiner Cric proposed changes to the language of several claims and, after some discussion and adjustment, the Examiner and the undersigned agreed to certain specific changes in the claims.

The foregoing claim amendments implement precisely the changes which the Examiner and the undersigned agreed to make, and do not introduce any additional changes. The Examiner and the undersigned agreed that these changes do not alter the intended scope of the claims. The Examiner indicated that the amended claims are in compliance with the second paragraph of 35 U.S.C. §112. Applicants maintain that the original claims and the amended claims are all in compliance with the second paragraph of §112, but have adopted the amended claims as a courtesy to the Examiner, without conceding that the original claims were actually indefinite.

Amendment to Specification

The pending Office Action maintains an objection to the specification, asserting that there is no antecedent basis in the specification for the term "fluid supply device" in Claim 13. In the sentence at lines 2-4 on page 3, the Office Action asserts that an amendment is needed to avoid guesswork in determining which portion of the disclosure corresponds to this claim terminology. Applicants believe that no potential for guesswork existed, because the only structure in the disclosed embodiments that meets this limitation from Claim 13 is the cooling system shown at 51 in FIGURE 3 and discussed on specification page 11. The originally-filed specification includes a clear explanation at lines 9-10 on page 11 that the system 51 is operable "to provide fluid coolant" to recited passageways. It is respectfully submitted that persons of

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

10

ordinary skill in the art would readily recognize, without any guesswork, that in the disclosed embodiments the indicated limitation of Claim 13 corresponds directly to the cooling system 51.

Nevertheless, as a courtesy to the Examiner, the foregoing amendment to the specification adds a sentence on page 11 which indicates that the system 51 is "a fluid supply device to supply fluid". Applicants respectfully submit however, that this added sentence is effectively redundant to the sentence which precedes it, and that an appropriate antecedent relationship between Claim 1 and the specification was present even before the amendment.

Functional Language

In the paragraph which bridges pages 3-4 of the Office Action, the Examiner notes that the pending claims include functional language, and suggests that this functional language does not carry patentable weight in distinguishing the claims from the prior art. The Examiner cites case law in support of a proposition that apparatus claims cover what a device is, and not what the device does. Applicants disagree, because this position is contrary to the view of experts, and also contrary to PTO policy. For example, a leading expert on patents states in a leading treatise that:

A number of decisions condemn patent claims for use of "functional" language, that is, language describing an invention in terms of what it accomplishes rather than in terms of what it is. [Footnote omitted] Functional language is objectionable when it causes a claim to (1) cover more than the inventor has invented and disclosed in the specification or (2) define the invention in a vague and ambiguous manner. Under the

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

11

better view today, [Footnote omitted] functional language in claims is not objectionable per se so long as it avoids these problems of undue breadth and vagueness.

Chisum, Donald S., Chisum on Patents, §8.04
(Release 84, 2002).

As a courtesy, Applicants are enclosing an excerpt from this treatise, which includes the language quoted above. In making the foregoing statement, Professor Chisum cites and relies on the case of *In Re Swinehart*, 439 F2d. 210, 169 USPQ 226 (CCPA 1971). The PTO conforms to the same view as Professor Chisum. In this regard, MPEP §2173.05(g) cites the *Swinehart* decision, and states that: "A functional limitation is an attempt to define something by what it does rather than what it is. . . . Functional language does not, in and of itself, render a claim improper". Similarly, MPEP §2173.01 cites the *Swinehart* decision, and states that: "Applicant may use functional language . . . or any style of expression or format of claim which makes clear the boundaries of the subject matter for which protection is sought. As noted by the Court in *In Re Swinehart*, 439 F2d. 210, 169 USPQ 226 (CCPA 1971), a claim may not be rejected solely because of the type of language used to define the subject matter for which patent protection is sought".

Therefore, although the claims of the present application do include some functional language, it is respectfully submitted that under court decisions and PTO policy, the functional language is in fact entitled to patentable weight. With this in mind, the fundamental issue is whether, under 35 U.S.C. §§102 or 103, the functional limitations are distinct from the art of record.

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

12

Differences Between the Claims and the Cited Art

Turning to the merits, independent Claims 1 and 17 have each been rejected under 35 U.S.C. §102 on the ground that they are anticipated by any one of Schubert U.S. Patent No. 6,299,657, Staskus U.S. Patent No. 5,835,345, Clyde U.S. Patent No. 4,222,434, Smith UK Publication No. 2,159,265, or VEB Inducal German Patent No. 240,986. Independent Claim 22 stands rejected under §102 as anticipated by any one of the Schubert, Smith, Staskus, Clyde and VEB Inducal patents. These grounds of rejection are respectfully traversed, for the following reasons.

Schubert, Staskus, Clyde, Smith and VEB Inducal each disclose an arrangement which is intended to maximize the amount of heat transferred from some physical structure to a fluid which flows through that structure. In contrast, the focus of the present invention does not inherently involve maximization of the amount of heat transferred. Instead, the present invention is intended to achieve a predetermined temperature profile within material along a passageway, by appropriate configuration of turbulence inducing structure within the passageway. In this regard, Claim 1 recites "turbulence inducing structure disposed along said passageway in manner selected to achieve, in response to fluid flow through said fluid passageway, a predetermined temperature profile along said passageway in said thermally conductive part". Claim 17 recites "a plurality of turbulence inducing structures disposed along said fluid passageway, wherein locations of said structures are selected to achieve, in response to fluid flow through said fluid passageway, a predetermined temperature profile along said passageway in said plate". Claim 22 recites "selecting a configuration of said [turbulence inducing] structure to achieve, in response

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

13

to fluid flow through said fluid passageway, a predetermined temperature profile along said passageway in said part".

The phrase "predetermined temperature profile along said passageway" reflects a predetermined relationship in the relative temperatures of any given pair of points spaced along the passageway. For example, in the case of an isothermal temperature profile, any two points at spaced locations along the passageway will be at substantially the same temperature. In the case of some other temperature profile, the two points may not be at the same temperature, but their respective temperatures will nevertheless conform to a predefined relationship with respect to each other.

In contrast, Schubert, Staskus, Clyde, Smith and VEB Inducal each seek to maximize the heat transfer rate to the fluid at any given point along the passageway, without regard to how the temperature at that point may relate to the temperature at any other point along the passageway. Consequently, although the Examiner points out that these pre-existing devices may each inherently have a temperature profile along the passageway, that profile is not a predetermined profile selected in advance of the design, but instead is more in the way of an aftereffect. Stated differently, the pre-existing devices have not been designed by selecting a predetermined temperature profile and then developing turbulence inducing structure which causes that predetermined profile to be realized. Instead, they seek to maximize heat transfer at each point along the passageway without regard to other points, and without regard to any predetermined profile. To the extent that a temperature profile later comes into existence during actual use of these pre-existing devices, the characteristic of the profile is an aftereffect resulting purely from happenstance, rather than

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

14

from intentional conformity to a predetermined profile selected prior to the actual design of the turbulence inducing structure.

Accordingly, it is respectfully submitted that Schubert, Staskus, Clyde, Smith and VEB Inducal each fail to disclose a significant and distinctive feature of the invention which is expressly recited in each of independent Claims 1, 17 and 22. It is therefore respectfully submitted that Claims 1, 17 and 22 are each patentably distinct from each of Schubert, Staskus, Clyde, Smith and VEB Inducal, and notice to that effect is respectfully requested.

Dependent Claims

Claims 2-16, Claims 18 and 20-21, and Claims 23-24 respectively depend from Claim 1, Claim 17 and Claim 22, and are also believed to be patentable over the art of record, for example for the same reasons discussed above with respect to Claims 1, 17 and 22.

In the paragraph bridging pages 4-5 of the Office Action, the Examiner asserts that Applicants' prior response was non-responsive to a §103 rejection of specified dependent claims. Applicants disagree. Applicants believe that independent Claims 1, 17 and 22 are allowable, and have explained in detail why these independent claims are patentable over the references used to reject them. If independent Claims 1, 17 and 22 are allowable, then all claims depending from them will also be automatically allowable over the prior art. Accordingly, Applicants have in fact presented a valid reason as to why Applicants believe the dependent claims are all allowable over all of the art of record. Thus, Applicants do not agree with the Examiner's assertion that

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

15

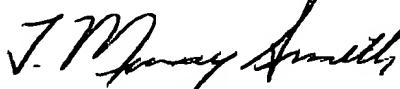
Applicants failed to give a reason as to why these claims are patentable over all of the cited art.

Conclusion

Based on the foregoing, it is respectfully submitted that all of the pending claims are fully allowable, and favorable reconsideration of this application is therefore respectfully requested. If the Examiner believes that examination of the present application may be advanced in any way by a telephone conference, the Examiner is invited to telephone the undersigned attorney at (214) 953-6684.

Although Applicants believe that no additional fees are due, the Commissioner is hereby authorized to charge any fee required by this paper, or to credit any overpayment, to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,
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Enclosures: Marked-up Version of Specification Paragraph
Marked-up Version of Amended Claims
Excerpt from Chisum Treatise (Title page and
page 8-99)

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

16

MARKED UP SPECIFICATION PARAGRAPH

The paragraph which appeared at lines 4-23 on page 11 of the specification is amended as follows:

The central openings through cooling loops 52 define continuous fluid passageways 54 within slat assembly 34. Fluid passageways 54 form paths of fluid communication between inlets 48 and outlets 50. Accordingly, cooling loops 52 may be coupled, using the interfaces 46, with external cooling systems 51 to provide fluid coolant to each inlet 48. In other words, each cooling system 51 is a fluid supply device to supply fluid coolant to an inlet 48. The coolant travels from each inlet 48 through passageway 54 to the corresponding outlet 50. A complete coolant loop is thereby formed allowing a continuous flow of fluid coolant to be provided through each cooling loop 52. The fluid coolant traveling through cooling loop 52 absorbs thermal energy generated by electronic components 20 and 38 of device 30. The amount of fluid provided for cooling is dictated by pressure drop and system capacity criteria. The high density packaging requirements of an active phased array antenna result in small volumes for cooling tubes which lead to reduced flow rates. The reduced flow rates then result in increased temperature rise in the fluid from inlet 48 to outlet 50. ---

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

17

MARKED-UP VERSION OF AMENDED CLAIMS

1. (Amended) An apparatus, comprising:

a thermally conductive part having a fluid passageway formed therein; and

turbulence inducing structure disposed along said passageway in a manner selected to achieve, in response to fluid flow through said fluid passageway, a predetermined temperature profile along said passageway in [material of] said thermally conductive part adjacent to said fluid passageway [, in response to fluid flow through said fluid passageway].

3. (Amended) An apparatus according to Claim 1, wherein said structure includes first and second protrusions extending inwardly into said passageway from a surface of said passageway, said first protrusion being generally opposite said second protrusion along a perimeter of said passageway in a plane approximately perpendicular to a longitudinal axis of said passageway.

4. (Twice Amended) An apparatus according to Claim 1, wherein said structure includes an inwardly projecting annular protrusion formed along a perimeter of said passageway in a plane [approximately] generally perpendicular to a longitudinal axis of said passageway.

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

18

5. (Amended) An apparatus according to Claim 1, wherein said structure includes a plurality of portions which each induce turbulence, wherein each said [portions are] portion is longitudinally spaced along said passageway by a respective longitudinal distance from every other said portion which is adjacent [said portions] thereto, and wherein the lengths of said longitudinal distances [between adjacent said portions] vary along said passageway.

6. (Amended) An apparatus according to Claim 1, wherein said structure includes a plurality of portions which each induce turbulence, wherein each said portion is longitudinally spaced along said passageway by a respective longitudinal distance from every other said portion which is adjacent thereto, wherein said fluid passageway includes a first section and a second section which are separate and which each include at least two of said portions, and wherein [first] said longitudinal distances between [adjacent] said portions [along] in said first section are greater than [second] said longitudinal distances between [adjacent] said portions [along] in said second section.

8. (Amended) An apparatus according to Claim 7, wherein said cold plate is made of a material which includes aluminum silicon carbide (AlSiC).

10. (Amended) An apparatus according to Claim 9, wherein said tubing is made of a material which includes stainless steel.

11. (Amended) An apparatus according to Claim 9, wherein said structure includes crimps formed [upon] in said

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

19

tubing, said crimps extending radially toward a longitudinal, central axis of said passageway.

15. (Amended) An apparatus according to Claim 14, further comprising a phased array antenna system, wherein [which includes] said part, said structure, and said electronic components are portions of said phased array antenna system.

16. (Amended) An apparatus according to Claim 14, wherein said temperature profile is [approximately] generally isothermal.

17. (Twice Amended) An apparatus, comprising:
a thermally conductive flat plate having a fluid passageway formed therein; and
a plurality of turbulence inducing structures disposed along said fluid passageway, wherein locations of said structures are selected to achieve, in response to fluid flow through said fluid passageway, a predetermined temperature profile along said passageway in [material of] said plate adjacent to said fluid passageway [, in response to fluid flow through said fluid passageway].

18. (Twice Amended) An apparatus according to Claim 17, wherein each said [structures are] structure is longitudinally spaced [from each other] along said passageway by a respective longitudinal distance from every other said structure which is adjacent thereto, and wherein the lengths of said longitudinal distances [between adjacent said structures] vary along said passageway.

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

20

20. (Amended) An apparatus according to Claim 17, wherein said structures each include an annular [inward] protrusion extending into said passageway.

22. (Amended) A method of maintaining a predetermined temperature profile along material of a thermally conductive part adjacent a fluid passageway formed within said part, comprising:

providing turbulence inducing structure within said fluid passageway; and

selecting a configuration of said structure to achieve, in response to fluid flow through said fluid passageway, a predetermined temperature profile along said passageway in [material of] said part adjacent to said fluid passageway [, in response to fluid flow through said fluid passageway].

23. (Amended) A method according to Claim 22, further comprising:

configuring said structure to include a plurality of portions which each induce turbulence;

spacing each said [portions] portion longitudinally [from adjacent said portions] along said passageway by a respective longitudinal distance from every other said portion which is adjacent thereto; and

selecting locations of said portions such that said longitudinal distances [between adjacent said portions] vary along said passageway.

ATTORNEY DOCKET NO.
004578.1073

PATENT APPLICATION
09/660,733

21

24. (Amended) A method according to Claim 22, further comprising:

configuring said structure to include a plurality of portions which each induce turbulence, said passageway having first and second sections which are separate and which each include at least two of said portions; and

selecting locations of said portions along said passageway such that [first] each said portion is longitudinally spaced by a respective longitudinal distance from every other said portion which is adjacent thereto, wherein said longitudinal distances between [adjacent] said portions [along a] in said first section of said passageway are greater than [second] said longitudinal distances between [adjacent] said portions [along a] in said second section of said passageway.

CHISUM ON PATENTS

A Treatise on the Law of Patentability, Validity and
Infringement

VOLUME 1

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8



8-99

CLAIMS

§ 8.04

§ 8.04 Functional Language in Claims

A number of decisions condemn patent claims for use of "functional" language, that is, language describing an invention in terms of what it *accomplishes* rather than in terms of what it *is*.¹ Functional language is objectionable when it causes a claim to (1) cover more than the inventor has invented and disclosed in the specification or (2) define the invention in a vague and ambiguous manner. Under the better view today,² functional language in claims is not objectionable per se so long as it avoids these problems of undue breadth and vagueness.

§ 8.04

¹ E.g., *General Elec. Co. v. Wabash Appliance Co.*, 304 U.S. 364 (1938), discussed at § 8.04[1][b]; *Holland Furniture Co. v. Perkins Glue Co.*, 277 U.S. 245 (1928), discussed at § 8.04[1][a]; *O'Reilly v. Morse*, 56 U.S. (15 How.) 62 (1854), discussed at § 1.03[2][b], §§ 7.03[7].

Compare *Caterpillar Inc. v. Detroit Diesel Corp.*, 961 F. Supp. 1249, 1252, 41 USPQ2d 1876, 1879 (N.D. Ind. 1996), *aff'd*, 194 F.3d 1336 (Fed. Cir. 1999) (unpublished) (quoting Treatise; "Patent claims may be drafted in 'functional' language, which 'describ[es] an invention in terms of what it accomplishes rather than in terms of what it is.' . . . Functional language is by its nature broad, and may run afoul of the Patent Act's requirement that a patent claim 'particularly point[] out and distinctly claim[] the subject matter which the applicant regards as his invention.' 35 U.S.C. § 112, ¶ 2 (based on 35 U.S.C., 1946 ed., § 33).")

Cf. Cultor Corp. v. A.E. Staley Manufacturing Co., 49 USPQ2d 1533 (S.D. N.Y. 1998), *aff'd*, 224 F.3d 1328, 56 USPQ2d 1208 (Fed. Cir. 2000). In *Cultor*, a patent claimed "a polydextrose bulking agent useful for incorporation in reduced calorie foods, substantially free of bitter-tasting compounds." Read in light of its specification, the patent was limited to "the water-soluble polydextrose prepared by melting and heating dextrose . . . in the presence of a catalytic amount of citric acid" 49 USPQ2d at 1534. The patentee contended that the patent included, under the doctrine of equivalents, a defendant's polydextrose bulking agent, which was made without the use of citric acid. The court disagreed. The Southern New York District Court reasoned that, under the patentee's construction, the claim would be invalid because it was for "a concept or desirable result."

"[T]o apply the doctrine of equivalents simply because defendant's product was 'free from bitter tasting compounds' would again run afoul of the principle that one can not patent a desirable result. Plaintiffs' argument brings to mind a commercial familiar to every sports fan in which a beer company asserts that its beer is 'less filling' and 'tastes great.' While the beer company may have a patented process by which it produces a beer having these qualities, its patent does not protect it from competition from other companies who produce less filling, great tasting beer by another process. Similarly, plaintiffs, who patented a process to remove bitter tasting citric acid esters from [the prior art] polydextrose, may not assert a claim of patent infringement against the defendant, who has manufactured a polydextrose using a different process, simply because the resulting product also tastes great because it is free from bitter tasting compounds."

49 USPQ2d at 1536.

² See *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971), discussed at § 8.04[3].

See also *Home Shopping Network, Inc. v. Coupco, Inc.*, 1998 WL 85740, *3 (S.D. N.Y. 1998) (quoting Treatise [Elec. ed. 1998]).